REMARKS

Claims 1-9 are pending in this application, of which claim 1 has been amended. No new claims have been added.

Claims 1-4 and 6-8 stand rejected under 35 U.S.C. §102(e) as anticipated by U.S. Patent No. 6,162,686 to **Huang et al.** (hereinafter "**Huang et al.**").

Applicants respectfully traverse this rejection.

Huang et al. discloses a method of forming a grooved fuse (plug fuse) in the same step that via plugs are formed in the guard ring area 14 and in product device areas. Key guard rings are formed around the plug guise. A semiconductor structure is provided having a fuse area, a guard ring area surrounding the fuse area, and a device area. First and second conductive strips are formed. First and second insulating layers are formed over the first and second conductive strips. Plug contacts and fuse plugs are formed through the first and second insulating layers to the first and second conductive strips. A third insulating layer is formed over the second insulating layer. Metal lines are formed over the third insulating layer in the device area. A fuse via opening is formed in the third insulating layer. A plug fuse is formed in the fuse via opening. A fourth insulating layer is formed over the plug fuse and the third insulating layer. A fuse opening is formed at least partially through the fourth insulating layer over the fuse area.

The Examiner urged that the groove located above plug fuse 58B shown in Fig. 5 meets the limitations of claims 1-3 and 8.

Applicants respectfully disagree. Fig. 5 shows pads 72 provided on the upper most interlayer insulation film 66, where the pads 72 are separated by the groove. **Huang et al.** fails to show a line

conductor, distinct from the pad, on an upper surface of the upper most interlayer insulation film 66. Although third plug ring 68 may be considered a line conductor, it is arranged within the upper most interlayer insulation film 66, not on the upper surface, as in the present invention.

Accordingly, claim 1 has been amended to recite this distinction.

Thus, the 35 USC §102(e) rejection should be withdrawn.

Claims 5 and 9 stand rejected under 35 U.S.C. §103(a) as unpatentable over **Huang et al.**

Applicants respectfully traverse this rejection.

Huang et al., as noted above, fails to teach, mention or suggest the features recited in claim 1, from which these claims depend.

Thus, the 35 USC §103(a) rejection should be withdrawn.

In view of the aforementioned amendments and accompanying remarks, claims 1-9, as amended, are in condition for allowance, which action, at an early date, is requested.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Version with markings to show changes made**."

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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PATENT TRADEMARK OFFICE

Enclosures: Version with markings to show changes made
Substitute Abstract of the Disclosure

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VERSION WITH MARKINGS TO SHOW CHANGES MADE 10/084,919

IN THE ABSTRACT:

Amend the Abstract as follows:

A structure for [preveting] preventing MMICs (Monolithic Microwave Integrated Circuits) from [the] deterioration in the high-frequency transmission characteristics thereof, which [is resulted] results from mechanical pressure applied to the pads during the wire-bonding thereto for external connection. The structure includes a groove provided in the surface of the interlayer insulation film around each of the pads. The line conductor for transmitting high-frequency signals is free from the peeling off or bending thereof, which is caused by the deformation in the interlayer insulation films during when the mechanical pressure applied to the pads, and thus, the change in the transmission characteristics of the line conductor can be minimized, and the reliability of MMICs can be improved.

IN THE SPECIFICATION:

Amend the specification as follows:

Paragraph beginning at page 1, line 5 has been amended as follows:

The present invention relates to an MMIC (Monolithic Microwave Integrated Circuit) having a wave guide for high-frequency signal transmission.

Paragraph beginning at page 1, line 8 has been amended as follows:

[Being different from] In contrast to conventional silicon integrated circuits, MMICs comprising high-speed semiconductor devices such as that represented by HEMT (High Electron Mobility Transistor) or HBT (Hetero Bipolar Transistor) necessarily include a wave guide as the inner transmission line for high-frequency signals. Micro-strip lines are generally used as the high-frequency signal wave guide, because of their stable line characteristics and low dispersion characteristics which means that the frequency dependency of the propagation constant is weak.

Paragraph beginning at page 1, line 16 has been amended as follows:

As shown in FIG.1, the MMIC having a conventional multi-layered structure includes ground plate 3 formed on the semiconductor substrate 1 with the insertion of surface insulation film 2 therebetween, and ground plate 3 forms micro-strip lines together with line conductors 5 each formed on each of interlayer insulation films 4, respectively. In addition to line conductors 5, a pad 6 for the external connection is provided on the most upper interlayer insulation film 4.

Paragraph beginning at page 1, line 22 has been amended as follows:

The MMIC having multi-layered high-frequency micro-strip lines, as explained with reference to FIG.1, has features that [it is] are suited to high density integration, compared to MMICs having line conductors disposed in a single layer.

Paragraph beginning at page 2, line 2 has been amended as follows:

It is an object of the present invention to provide a structure of a three-dimensional MMIC designed by taking reliability into consideration.

Paragraph beginning at page 2, line 6 has been amended as follows:

The interlayer insulation film of such resin insulating material is relatively soft and is apt to deform[,] when [a] pressure is applied thereto. Pads, for instance, are subjected to a mechanical shock by the tip of a bonding tool during wire bonding thereto, and deformation is caused in the interlayer insulation film around there.

Paragraph beginning at page 2, line 10 has been amended as follows:

As a result, line conductor 5 on the most upper interlayer insulation film [would] tends to peel off or [bends] bend. When wire bonding is over and application of the pressure by the bonding tool is removed, the interlayer insulation film can recover from the deformation by itself. However, the line conductor that is once peeled off or bent cannot [restore] be restored, and results in the change of its high-frequency transmission characteristics.

Paragraph beginning at page 2, line 17 has been amended as follows:

FIG.2 shows the essential concept of the present invention. As shown in the drawing, groove 7 is provided adjacent to pad 6, and thus, the PAD REGION and the WIRING REGION are physically separated from each other at least by the groove near the respective surfaces thereof. Accordingly, even when pad 6 is subjected to wire bonding processes, aforesaid

deformation caused in the interlayer insulation film by the pressure applied to pad 6 is relaxed by the shape effect of groove 7, and the influence of the deformation on the WIRING REGION can be alleviated.

IN THE CLAIMS:

Please amend claim 1 as follows:

1. (Amended) A high-frequency semiconductor device comprising:

a ground plate provided on a semiconductor substrate;

a plurality of line conductors provided on said ground plate, forming a multiple layer structure with interlayer insulation films intervening therebetween that is composed of a resin insulating material;

a pad provided on an upper surface of a most upper one of said interlayer insulation films; and

a groove provided in said most upper one of said interlayer insulation films and between said pad and said line conductor on said upper surface of said most upper one of said interlayer insulation films.

ABSTRACT OF THE DISCLOSURE:

A structure for preventing MMICs (Monolithic Microwave Integrated Circuits) from deterioration in the high-frequency transmission characteristics thereof, which results from mechanical pressure applied to the pads during the wire-bonding thereto for external connection. The structure includes a groove provided in the surface of the interlayer insulation film around each of the pads. The line conductor for transmitting high-frequency signals is free from the peeling off or bending thereof, which is caused by the deformation in the interlayer insulation films during when the mechanical pressure applied to the pads, and thus, the change in the transmission characteristics of the line conductor can be minimized, and the reliability of MMICs can be improved.